

What is claimed is:

1. A method of compressing speech data, comprising:
parsing an input waveform into pitch segments;
5 determining principal components of at least one pitch segment;
sending a subset of the determined principal components during an initial transmission period; and
sending coefficients of the input waveform for each pitch
10 segment during a period subsequent to the initial transmission period.
2. The method of claim 1 wherein sending a subset of the principal components comprises sending six principal
15 components.
3. The method of claim 1 wherein determining comprises:
determining the number of pitch periods; and
generating a correlation matrix.
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4. The method of claim 1 wherein determining comprises:
ordering the principal components.
5. The method of claim 1, further comprising:
25 determining coefficients for each pitch period.
6. The method of claim 1, further comprising:
determining if the principal components are still valid.
- 30 7. The method of claim 6 wherein determining if the principal components are still valid comprises:

determining if a pitch segment exceeds a predetermined threshold.

5 8. The method of claim 7 wherein the predetermined threshold is a measure of a distance from a pitch segment to a centroid determined by the principal components.

10 9. The method of claim 7, further comprising:
selecting a new set of principal components when the predetermined threshold is exceeded.

10. The method of claim 1, further comprising:
reconstructing the input waveform.

15 11. The method of claim 10 wherein reconstructing comprises:
scaling the principal components by the coefficients for each pitch segment to form scaled components; and
summing the scaled components.

20 12. The method of claim 10, wherein reconstructing further comprises:

concatenating reconstructed components of the input waveform; and

25 using a smoothing filter while concatenating the reconstructed components.

13. The method of claim 10 wherein the smoothing filter is an alpha blend filter.

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14. The method of claim 1, further comprising:

reducing the principal components to reduce the number of bits transmitted.

15. The method of claim 1, further comprising:

5 improving the accuracy of reconstructing the input waveform by increasing the number of principal components.

16. A method of receiving an input waveform, comprising:

receiving a subset of determined principal components of
10 at least one pitch segment during an initial transmission period; and

receiving coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

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17. The method of claim 16 wherein reconstructing comprises:

scaling the principal components by the coefficients for each pitch segment to form scaled components; and

20 summing the scaled components.

18. The method of claim 16, wherein reconstructing further comprises:

concatenating reconstructed components of the input
25 waveform; and

using a smoothing filter while concatenating the reconstructed components.

19. The method of claim 18 wherein the smoothing filter
30 is an alpha blend filter.

20. A method of compressing speech data, comprising:
parsing an input waveform into pitch segments;
determining principal components of at least one pitch
segment;

5 sending a subset of the determined principal components
during an initial transmission period;

 sending coefficients of the input waveform for each pitch
segment during a period subsequent to the initial transmission
period;

10 receiving a subset of determined principal components of
at least one pitch segment during an initial transmission
period; and

 receiving coefficients of the input waveform for each
pitch segment during a period subsequent to the initial
15 transmission period.

21. An apparatus comprising:

 a memory that stores executable instructions for
compressing speech data; and

20 a processor that executes the instructions to:

 parse an input waveform into pitch segments;

 determine principal components of at least one pitch
segment;

 send a subset of the determined principal components
25 during an initial transmission period; and

 send coefficients of the input waveform for each
pitch segment during a period subsequent to the initial
transmission period.

22. The apparatus of claim 21 wherein to send a subset of the principal components comprises sending six principal components.

5 23. The apparatus of claim 21 wherein to determine comprises:

 determining the number of pitch periods; and
 generating a correlation matrix.

10 24. The apparatus of claim 21 wherein to determine comprises:

 ordering the principal components.

 25. The apparatus of claim 21, further comprising
15 instructions to:

 determine coefficients for each pitch period.

 26. The apparatus of claim 21, further comprising
instructions to:

20 determine if the principal components are still valid.

 27. The apparatus of claim 26 wherein the instructions to determine if the principal components are still valid comprises:

25 determining if a pitch segment exceeds a predetermined threshold.

 28. The apparatus of claim 27 wherein the predetermined threshold is a measure of a distance from a pitch segment to a
30 centroid determined by the principal components.

29. The apparatus of claim 27, further comprising instructions to:

select a new set of principal components when the predetermined threshold is exceeded.

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30. The apparatus of claim 21, further comprising instructions to:

reconstruct the input waveform.

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31. The apparatus of claim 30 wherein instructs to reconstruct comprises:

scaling the principal components by the coefficients for each pitch segment to form scaled components; and summing the scaled components.

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32. The apparatus of claim 30, wherein instructions to reconstruct comprises:

concatenating reconstructed components of the input waveform; and

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using a smoothing filter while concatenating the reconstructed components.

33. An apparatus comprising:

a memory that stores executable instructions for receiving an input waveform; and

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a processor that executes the instructions to:

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

5 34. The apparatus of claim 33, wherein instructions to reconstruct comprises:
 scaling the principal components by the coefficients for each pitch segment to form scaled components; and
 summing the scaled components.

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 35. The apparatus of claim 33, wherein instructions to reconstruct comprises:
 concatenating reconstructed components of the input waveform; and
15 using a smoothing filter while concatenating the reconstructed components.

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 36. An apparatus comprising:
 a memory that stores executable instructions for
20 compressing speech data; and
 a processor that executes the instructions to:
 parse an input waveform into pitch segments;
 determine principal components of at least one pitch segment;
25 send a subset of the determined principal components during an initial transmission period;
 send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period;

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

5 receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

37. An article comprising a machine-readable medium that stores executable instructions for compressing speech data,
10 the instructions causing a machine to:

parse an input waveform into pitch segments;
determine principal components of at least one pitch segment;

15 send a subset of the determined principal components during an initial transmission period; and

send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

20 38. The article of claim 37 wherein instructions causing a machine to send a subset of the principal components comprise instructions causing a machine to send six principal components.

25 39. The article of claim 37 wherein instructions causing a machine to determine comprise instructions causing a machine to:

determine the number of pitch periods; and
generating a correlation matrix.

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40. The article of claim 37 wherein instructions causing a machine to determine comprise instructions causing a machine to:

order the principal components.

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41. The article of claim 37, further comprising instructions causing a machine to:

determine coefficients for each pitch period.

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42. The article of claim 37, further comprising instructions causing a machine to:

determine if the principal components are still valid.

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43. The article of claim 42 wherein instructions causing a machine to determine if the principal components are still valid comprise instructions causing a machine to:

determine if a pitch segment exceeds a predetermined threshold.

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44. The article of claim 43 wherein the predetermined threshold is a measure of a distance from a pitch segment to a centroid determined by the principal components.

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45. The article of claim 43, further comprising instructions causing a machine to:

select a new set of principal components when the predetermined threshold is exceeded.

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46. The article of claim 37, further comprising instructions causing a machine to:

reconstructing the input waveform.

47. The article of claim 46 wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

5 scale the principal components by the coefficients for each pitch segment to form scaled components; and
sum the scaled components.

48. The article of claim 46, wherein instructions
10 causing a machine to reconstruct further comprise instructions causing a machine to:

concatenate reconstructed components of the input waveform; and

15 use a smoothing filter while concatenating the reconstructed components.

49. An article comprising a machine-readable medium that stores executable instructions for receiving an input waveform, the instructions causing a machine to:

20 receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

25 receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

50. The article of claim 49, wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

30 scaling the principal components by the coefficients for each pitch segment to form scaled components; and

summing the scaled components.

51. The article of claim 49, wherein instructions causing a machine to reconstruct comprise instructions causing a machine to:

concatenate reconstructed components of the input waveform; and

use a smoothing filter while concatenating the reconstructed components.

52. An article comprising a machine-readable medium that stores executable instructions for compressing speech data, the instructions causing a machine to:

parse an input waveform into pitch segments;

determine principal components of at least one pitch segment;

send a subset of the determined principal components during an initial transmission period;

send coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period;

receive a subset of determined principal components of at least one pitch segment during an initial transmission period; and

receive coefficients of the input waveform for each pitch segment during a period subsequent to the initial transmission period.

53. The method of claim 1, further comprising:

comparing principal components to a library of principal components previously spoken by a speaker.

54. The method of claim 53, further comprising:
generating phonemes; and
converting the phonemes to text.

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55. The method of claim 1, further comprising:
receiving a phoneme; and
combining the coefficients and the principal components
with the phoneme to produce natural speech.

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56. The method of claim 55, further comprising;
altering the coefficients to reflect user selectable
intonations.

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57. The method of claim 16, further comprising:
comparing principal components to a library of principal
components previously spoken by a speaker.

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58. The method of claim 57, further comprising:
generating phonemes; and
converting the phonemes to text.

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59. The method of claim 16, further comprising:
receiving a phoneme; and
combining the coefficients and the principal components
with the phoneme to produce natural speech.

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60. The method of claim 59, further comprising;
altering the coefficients to reflect user selectable
intonations.